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Quality of Canadian food-type soybeans 2016

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Introduction

This report presents the quality data for the 2016 harvest survey of Canadian food-type soybeans conducted by the Canadian Grain Commission. Samples collected through the cooperation of Soy Canada, soybean processors and producers across Prairies, Ontario, Quebec and Atlantic regions were submitted to the Canadian Grain Commission's Grain Research Laboratory for analysis.

Harvest survey samples

The Canadian Grain Commission (CGC) received 19 natto-type and 456 generic food-type soybean samples including 6 from Prairies, 313 from Ontario, and 137 from Quebec region. All samples were graded by the CGC's Industry Services (IS) and were Canada No.2 or higher. Composite samples were prepared according to region as shown in Fig. 1. Composites were also prepared according to individual processor, and processor by region. All composite samples were analyzed for 100-seed weight, water absorption capacity/water uptake factor, protein, oil, sugar and total isoflavones content. Protein and oil content were determined using a Tecator Infratec 1241 Grain Analyzer near-infrared (NIR) spectrometer which was calibrated and verified against the appropriate laboratory reference method. Sugars and isoflavones were analyzed by high performance liquid chromatography (HPLC) methods. It is important to note that samples reported by grade do not necessarily represent the actual distribution of grade.

Figure 1 – Map of Canada showing origin of 2016 food-type soybean samples from CGC's Harvest Sample Program

Quality of 2016 Canadian food-type soybeans

Protein and oil content

Protein content for 2016 Canadian food-type soybeans ranged from 35.4 g to 52.1 g per 100 g dry matter (Table 1). The mean protein content in 2016 was 42.2 g per 100 g dry matter, which was higher than the mean in 2015 (41.9 g per 100 g dry matter). The mean protein contents for Prairies, Ontario and Quebec for 2016 were 36.4, 42.1 and 42.6 g per 100 g dry matter, respectively.

Oil content for 2016 Canadian food-type soybeans varied from 16.0 g to 25.4 g per 100 g dry matter (Table 2). The mean oil content in 2016 was 21.7 g per 100 g dry matter, which was slightly higher than that for 2015. The mean oil content for Prairies in 2016 was 22.5 g per 100 g dry matter. The mean oil content for Ontario in 2016 was 21.8 g per 100 g dry matter, which was similar to that in 2015. The mean oil content for Quebec in 2016 was 21.5 g per 100 g dry matter, which was higher than the mean for 2015.

Canadian generic food-type soybeans

Table 3 shows the quality data for 2016 Canadian generic food-type soybeans used for tofu, soymilk or miso. Mean 100-seed weight for 2016 generic food-type soybean was 21.6 g, which was higher than the mean for 2015 (19.6 g). Water absorption capacity was 1.14 g H_2O per g seeds, which was slightly lower than that for 2015. Water uptake fator was 2.14 for 2016. Seed size and water uptake are important quality characteristics of food-type soybeans for the production of tofu, soymilk and miso.

The mean protein content for 2016 Canadian generic food-type soybean was 42.4 g per 100 g dry matter (Table 3), which was lower than the mean for 2015 (43.1 g per 100 g dry matter). The mean oil content for 2016 was 21.6 g per 100 g dry matter, which was higher than the mean for 2015 (19.6 g per 100 g dry matter).

The mean sucrose content in 2016 generic food-type soybean was 57.6 g per kg dry matter, which was close to the mean for 2015 (57.4 g per kg dry matter) (Table 3). The mean total oligosaccharides content for 2016 was 46.4 g per kg dry matter, which was lower than the mean for 2015 (49.0 g per kg dry matter).

The mean total isoflavones content for 2016 Canadian generic food-type soybean was 2211 mg per kg dry matter, which was slightly lower than the mean for 2015 (Table 3).

Canadian natto-type soybeans

Table 4 displays the quality data for 2016 Canadian natto-type soybeans. Mean 100-seed weight for 2016 natto-type soybean was 9.9 g. Water

absorption value was 1.18 g H_2O per g seeds and water uptake factor was 2.18.

The mean protein content for 2016 Canadian natto-type soybean was 39.0 g per 100 g dry matter whereas the mean oil content was 21.8 g per 100 g dry matter (Table 4).

The mean sucrose content for 2016 Canadian natto-type soybean was 57.4 g per kg dry matter (Table 4). The mean oligosaccharides content was 46.7 g per kg dry matter. The mean total isoflavones content was 2415 mg per kg dry matter.

Table 1 – Mean protein content for 2016 Canadian food-type soybeans by grade and province[1]

	Protein content, g/100 g DM (dry matter)			
	2016			2015
Province/Region	Number of sample	Mean	Range	Mean
Prairies				
Soybean, No. 1 Canada	NS[2]	NS	NS	NS
Soybean, No. 2 Canada	6	36.4	35.4–40.1	NS
All grades	**6**	**36.4**	35.4–40.1	**NS**
Ontario				
Soybean, No. 1 Canada	140	42.0	37.2–47.0	40.8
Soybean, No. 2 Canada	185	42.2	35.9–50.0	41.4
All grades	**325**	**42.1**	35.9–50.0	**41.2**
Quebec				
Soybean, No. 1 Canada	30	42.6	40.1–45.0	NS
Soybean, No. 2 Canada	113	42.6	38.0–52.1	43.6
All grades	**143**	**42.6**	38.0–52.1	**43.6**
Canada				
Soybean, No. 1 Canada	170	42.1	37.2–47.0	40.8
Soybean, No. 2 Canada	305	42.2	35.4–52.1	42.3
All grades	**475**	**42.2**	35.4–52.1	**41.9**

[1]Protien content (Nx6.25) is determined by near infrared measurement calibrated against the Combustion Nitrogen Analysis reference method.

[2]NS=insufficient number of samples to generate a representative value.

Table 2 – Mean oil content for 2016 Canadian food-type soybeans by grade and province[1]

	Oil content, g/100 g DM (dry matter)			
	2016			2015
Province/Region	Number of sample	Mean	Range	Mean
Prairies				
Soybean, No. 1 Canada	NS[2]	NS	NS	NS
Soybean, No. 2 Canada	6	22.5	21.8–22.7	NS
All grades	**6**	**22.5**	21.8–22.7	**NS**
Ontario				
Soybean, No. 1 Canada	140	21.9	19.7–25.4	21.8
Soybean, No. 2 Canada	185	21.8	17.2–24.8	21.6
All grades	**325**	**21.8**	17.2–25.4	**21.7**
Quebec				
Soybean, No. 1 Canada	30	21.9	20.4–23.6	NS
Soybean, No. 2 Canada	113	21.4	16.0–23.8	21.1
All grades	**143**	**21.5**	16.0–23.8	**21.1**
Canada				
Soybean, No. 1 Canada	170	21.9	19.7–25.4	21.8
Soybean, No. 2 Canada	305	21.7	16.0–24.8	21.4
All grades	**475**	**21.7**	16.0–25.4	**21.5**

[1]Oil content is determined by near infrared measurement calibrated against the ISO 10565:1992(E) reference method.

[2]NS=insufficient number of samples to generate a representative value.

Table 3 Quality data for 2016 Canadian generic food-type soybean composites[1]			
Quality parameter	Number of sample	2016	2015
Physical characteristic			
100-seed weight, g/100 seeds	456	21.6	19.6
Water absorption, g H_2O/g seeds	456	1.14	1.22
Water uptake factor, g soaked wt/g seeds	456	2.14	2.22
Chemical composition (g/100 g DM)			
Protein content	456	42.4	43.1
Oil content	456	21.6	19.6
Sugar content (g/kg DM)			
Sucrose	456	57.6	57.4
Raffinose	456	9.0	9.4
Stachyose	456	36.9	38.8
Verbascose	456	0.50	0.80
Total oligosaccharides[2]	456	46.4	49.1
Isoflavones (mg/kg DM)			
Total isoflavones[3]	456	2211	2345

[1]Soybean, No. 1 Canada and No. 2 Canada combined.

[2]Sum of raffinose, stachyose and verbascose.

[3]Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.

Table 4 Quality data for 2016 Canadian natto-type soybean composites[1]			
Quality parameter	Number of sample	2016	2015
Physical characteristic			
100-seed weight, g/100 seeds	19	9.9	NS[4]
Water absorption, g H_2O/g seeds	19	1.18	NS
Water uptake factor, g soaked wt/g seeds	19	2.18	NS
Chemical composition (g/100 g DM)			
Protein content	19	39.0	NS
Oil content	19	21.8	NS
Sugar content (g/kg DM)			
Sucrose	19	57.4	NS
Raffinose	19	8.9	NS
Stachyose	19	37.6	NS
Verbascose	19	0.23	NS
Total oligosaccharides[2]	19	46.7	NS
Isoflavones (mg/kg DM)			
Total isoflavones[3]	19	2415	NS

[1]Soybean, No. 1 Canada and No. 2 Canada combined.

[2]Sum of raffinose, stachyose and verbascose.

[3]Sum of isoflavone aglycones (daidzein, genistein and glycitein), glucosides, malonyl glucosides and acetyl glucosides.

[4]NS=insufficient number of samples to generate a representative value.